

Capability Maturity Model Integration (CMMI®) From a Project Management Perspective

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March 30, 2004

Presentation Topics

- Background on CMM[®] and CMMI[®]
- Features of the CMMI[®] model
- CMMI[®] emphasis on project management
- CMM[®] and CMMI[®] Implementation
Lessons Learned

The Software Engineering Institute (SEI)



- Federally Funded Research & Development Center (FFRDC) at Carnegie Mellon University
- Mission is to foster improvement of project and software processes
- Developed Capability Maturity Model[®] (CMM[®]) and Assessment Methodology (CBA IPI)
- Developed Capability Maturity Model Integration (CMMI[®]) and Appraisal Methodology (SCAMPISM)
- SEI authorizes lead appraisers to facilitate CBA IPI and SCAMPISM appraisals

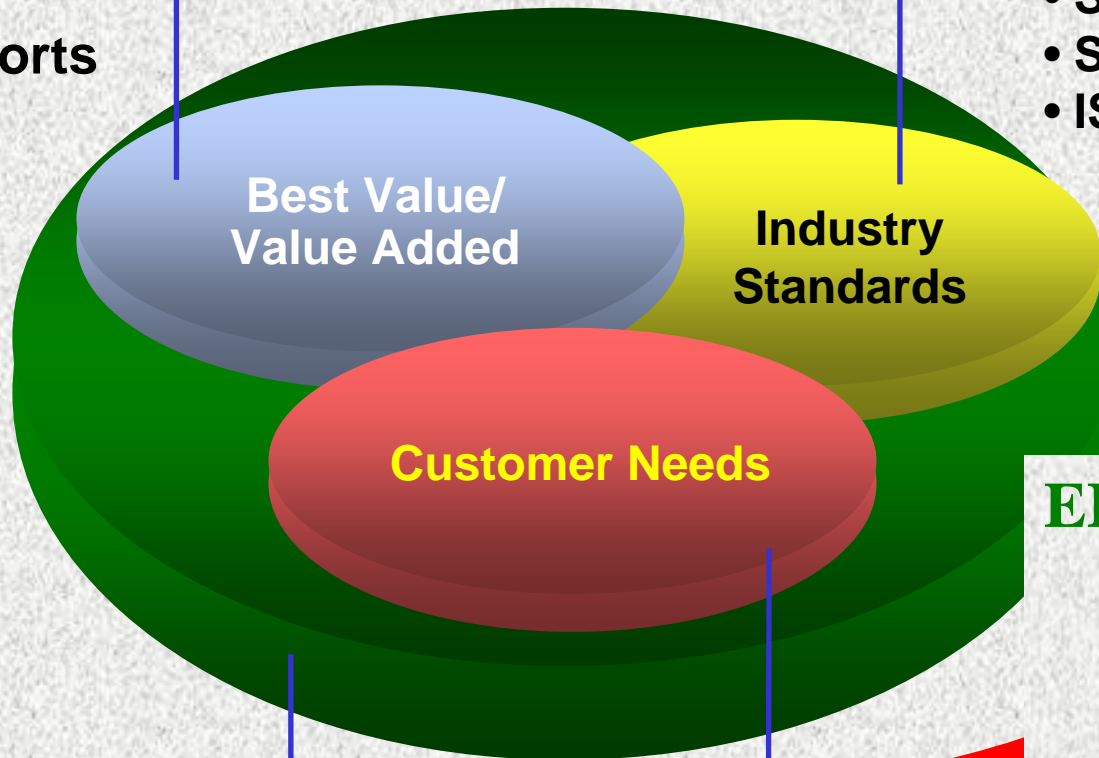
The Evolution of CMMI from Other Models

Best Value/Best Practice

- Organization
- Industry Reports

Industry Standards

- SEI CMM
- SE CM & EIA 731
- ISO

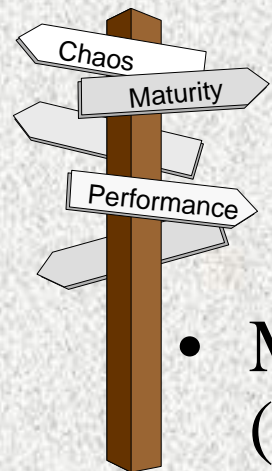


**EIA/IS 731 Key
to Rapid
CMMI
Transition**

Capability Model Integration

- CMMI

Prime Contractor Specs

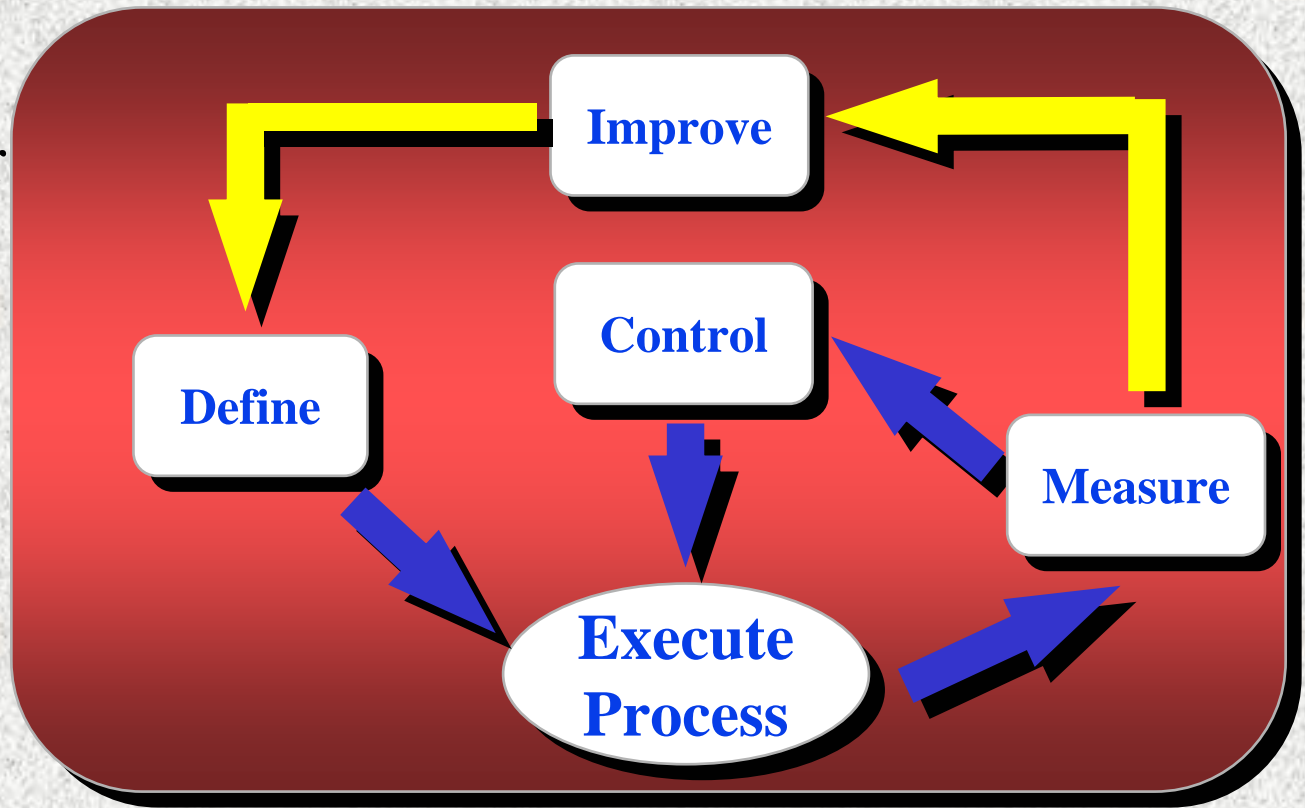


What are the CMM[®] and CMMI[®]?

- Models for organizational Process Improvement (PI) and improved practices
 - They benchmark the process not the product
- Community-owned PI framework to support an organization's process improvement project
 - Facilitates identifying, importing, and adopting best practices
 - Framework includes reference models, training products and appraisal methods
- An underlying structure for reliable and consistent project and organization process appraisals

Process Management Premise

- An undefined process cannot be controlled (or measured)
- An uncontrolled process cannot be improved
- Attempting to improve an unstable process yields further instability



Adapted from SEI

CMMI® Models and Representations

- CMMI® Models
 - CMMI® - SW (Software only)
 - CMMI® - SE/SW (Systems & Software)
 - CMMI® - SE/SW/IPPD (+Integrated Product & Process Development)
 - CMMI® - SE/SW/IPPD/SS (+Supplier Sourcing)
- CMMI® Representations
 - Staged Representation
 - Continuous Representation

The Evolution of Process Areas from CMM® to CMMI®

Level	CMM Key Process Areas (KPA's)	CMMI Process Areas (PAs)
5 Optimizing	Process Change Management Technology Change Management Defect Prevention	Organizational Innovation and Deployment Causal Analysis and Resolution
4 Quantitatively Managed	Software Quality Management Quantitative Process Management	Organizational Process Performance Quantitative Project Management
3 Defined	Software Product Engineering Peer Reviews Organizational Process Focus Organizational Process Definition Training Program Intergroup Coordination Integrated software Management	Requirements Development Technical Solution Product Integration Verification Validation Organizational Process Focus Organizational Process Definition Organizational Training Integrated Project Management for IPPD Risk Management Integrated Teaming Integrated Supplier Management Decision Analysis and Resolution Organizational Environment for Integration
2 Managed	Requirements Management Software Project Planning Software Project Tracking & Oversight Software Sub-contract Management Software Quality Assurance Software Configuration Management	Requirements Management Project Planning Project Monitoring and Control Supplier Agreement Management Measurement and Analysis Process and Product Quality Assurance Configuration Management
1 Initial		

The Continuous Representation Has Six Capability Levels

5 Optimizing

4 Quantitatively Managed

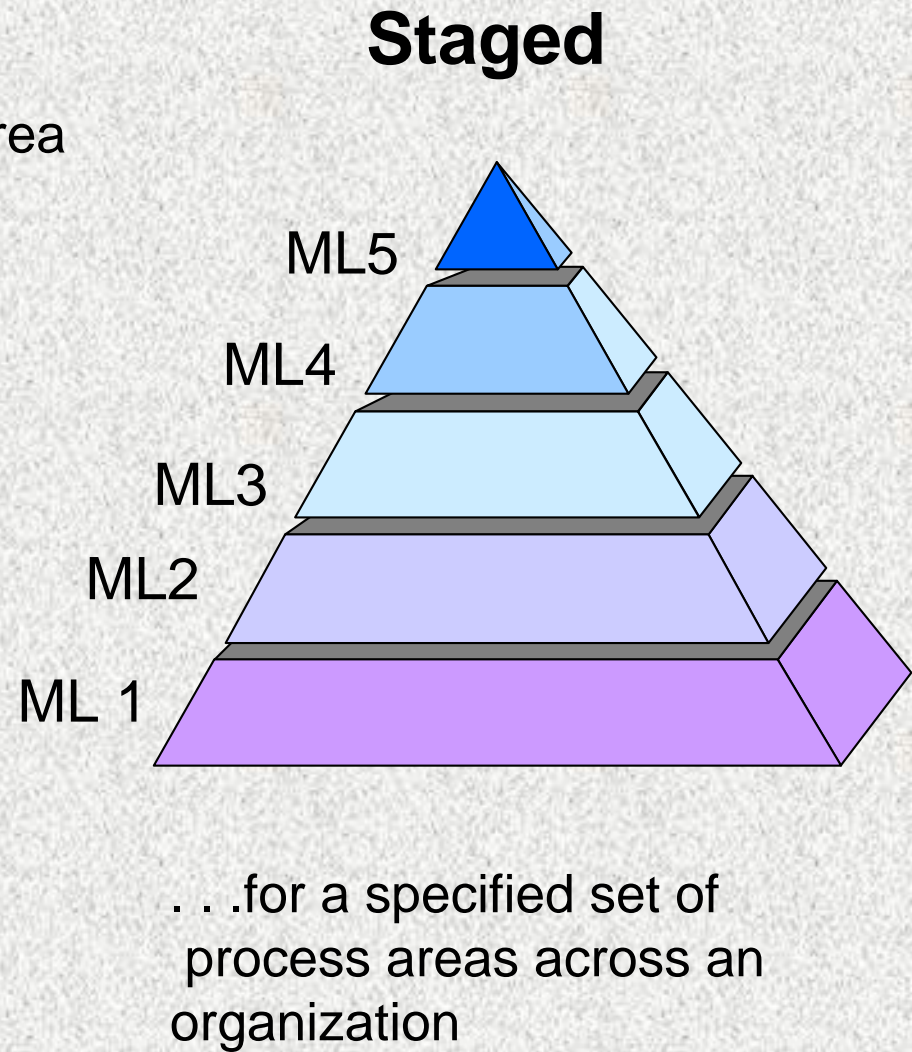
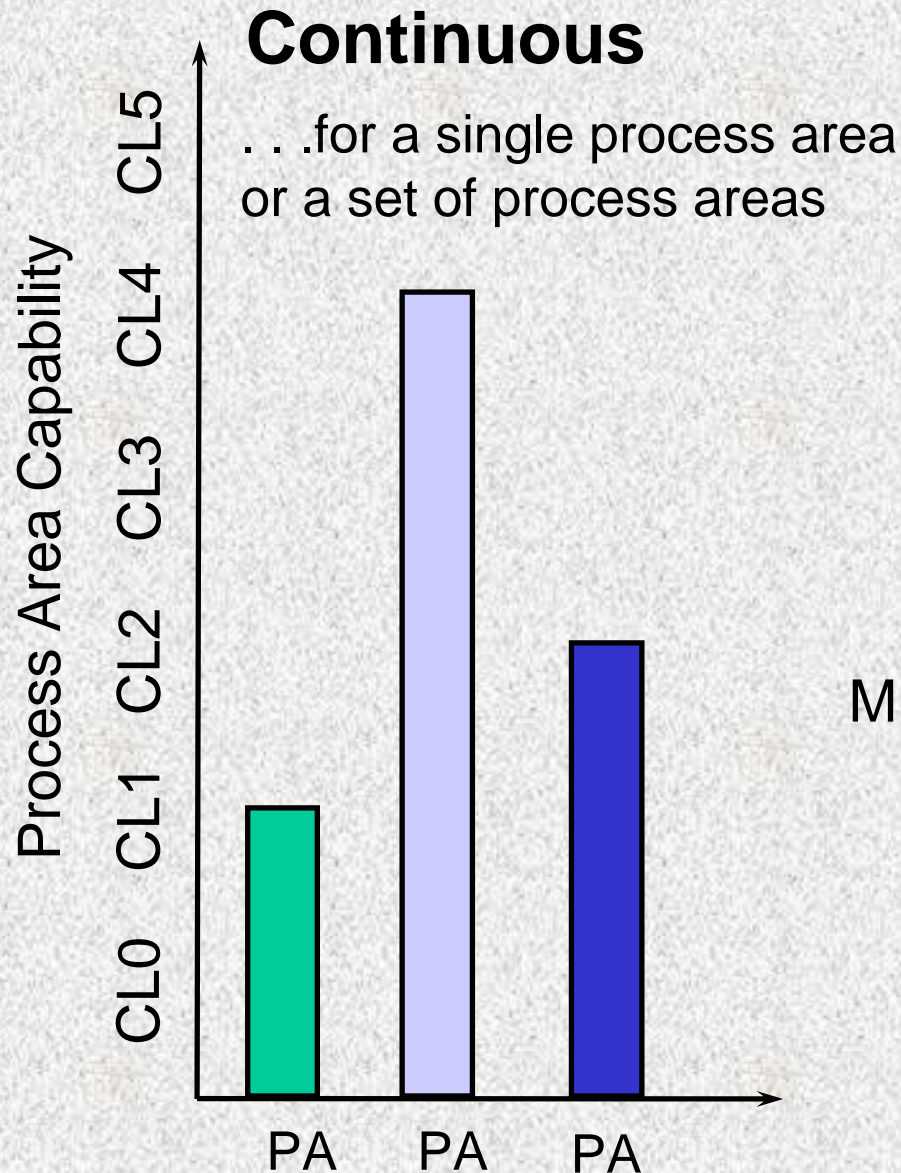
3 Defined

2 Managed

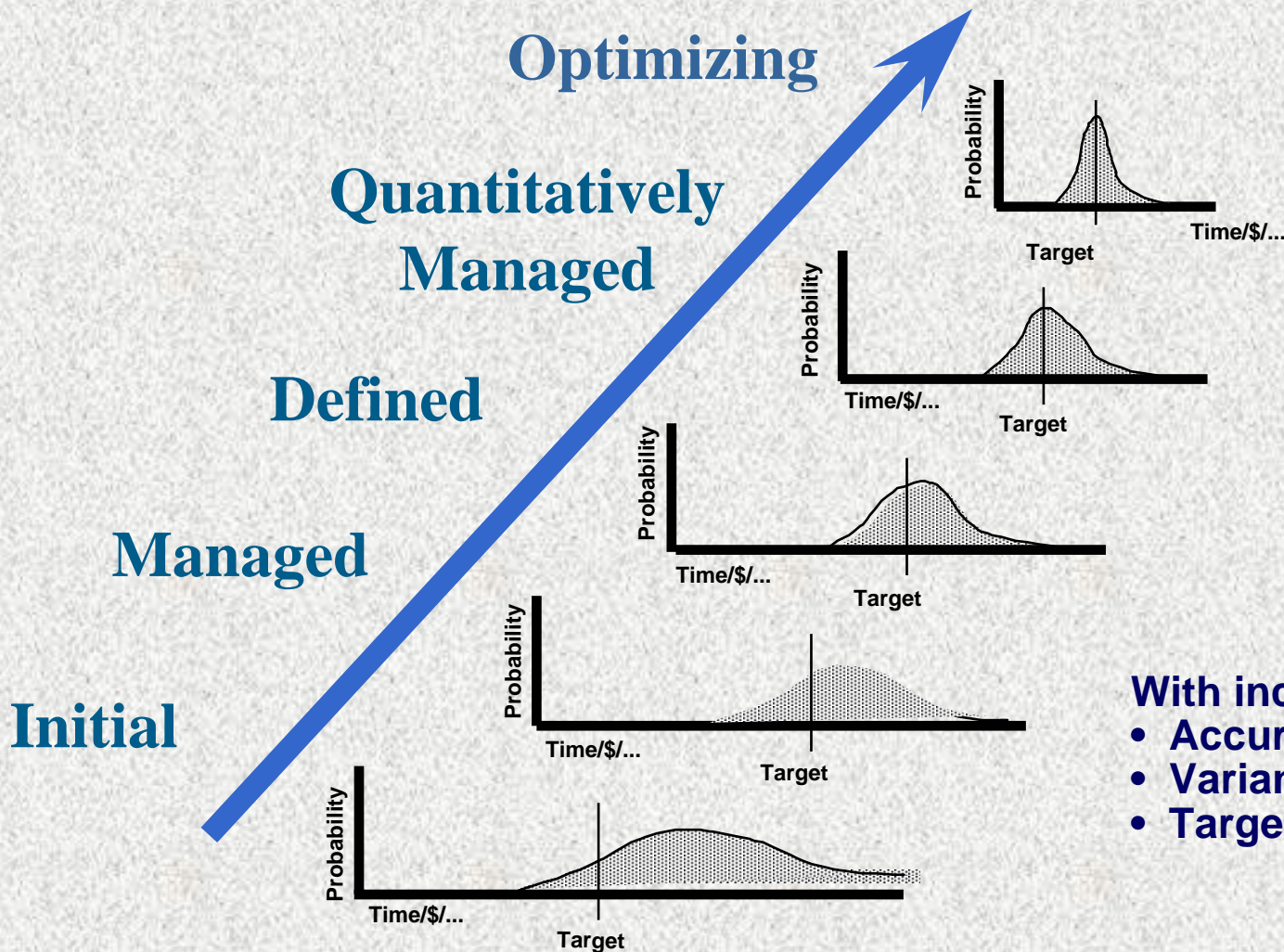
1 Performed

0 Incomplete

A Comparison of the Staged and the Continuous



Reduced Risk; Improved Productivity and Quality



- With increasing maturity
- Accuracy increases
 - Variance reduces
 - Target improves

How CMMI® Supports Planning and Managing a Project

- Project Management process areas
- Engineering process areas
- Support process areas
- Process Management process areas



Primary Focus of Project Management Process Areas

Project Planning	<ul style="list-style-type: none">• Establish and maintain estimates• Develop a project plan• Obtain commitments to the plan
Project Monitoring & Control	<ul style="list-style-type: none">• Monitor project against the plan• Manage corrective actions to closure
Risk Management	<ul style="list-style-type: none">• Prepare for risk management• Identify and analyze risks• Mitigate risks
Supplier Agreement Management	<ul style="list-style-type: none">• Establish supplier agreements• Satisfy supplier agreements

Primary Focus of Engineering Process Areas

Requirements Management	<ul style="list-style-type: none">•Manage requirements and reconcile inconsistencies
Requirements Development	<ul style="list-style-type: none">•Develop customer requirements•Develop product requirements•Analyze and validate requirements
Technical Solution	<ul style="list-style-type: none">•Select product-component solutions•Develop the design•Implement the design
Product Integration	<ul style="list-style-type: none">•Prepare for product integration•Ensure interface compatibility•Assemble product components & deliver product
Verification & Validation	<p>Prepare for & perform Verification & Validation</p> <p>Perform peer reviews</p>

Primary Focus of Support Process Areas

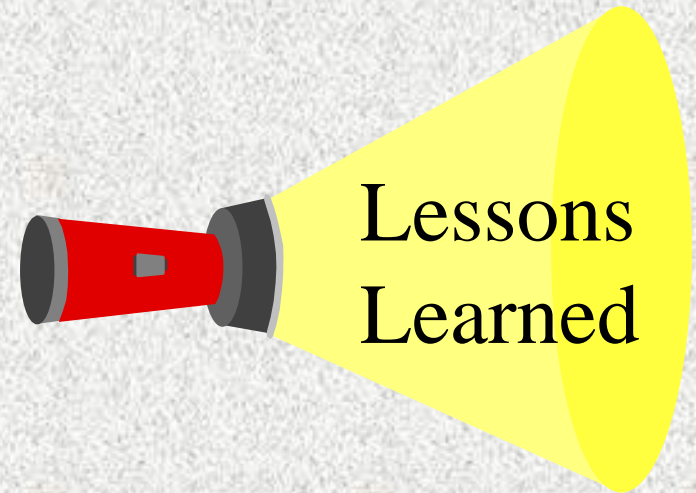
Configuration Management	<ul style="list-style-type: none">• Establish product baselines• Track and control changes• Establish baseline integrity
Quality Assurance	<ul style="list-style-type: none">• Objectively evaluate processes and products• Provide objective insight to engineering & management
Measurement & Analysis	<ul style="list-style-type: none">• Business focus for measurement & analysis activities• Provide measurement results
Decision Analysis & Resolution	<ul style="list-style-type: none">• Evaluate alternatives using established criteria

Primary Focus of Process Management Process Areas

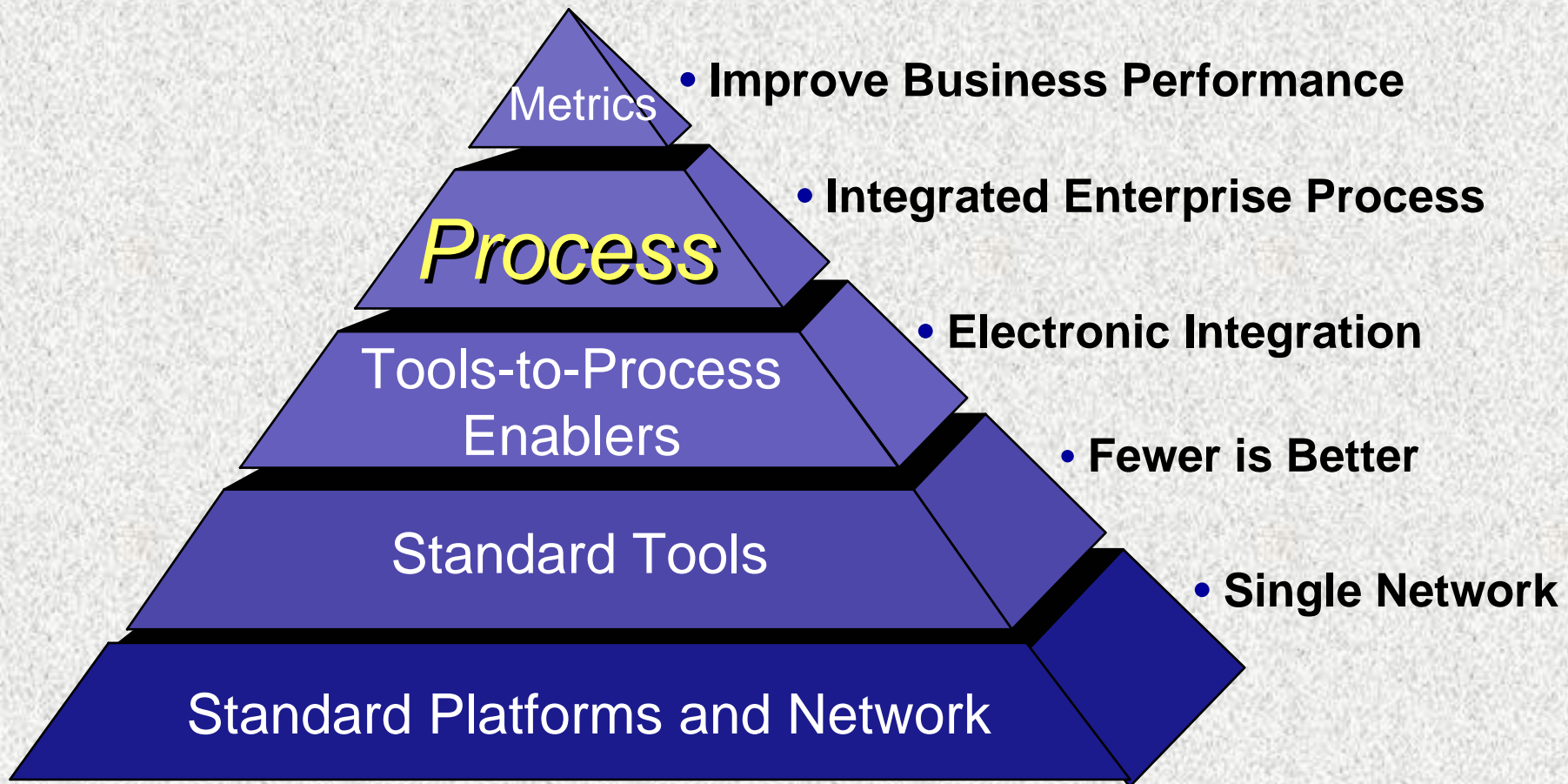
Organizational Process Focus	<ul style="list-style-type: none">•Determine process improvement opportunities•Plan and implement process improvement opportunities
Organizational Process Definition	<ul style="list-style-type: none">•Establish organizational process assets
Organizational Training	<ul style="list-style-type: none">•Establish an organizational training capability•Provide the necessary training
Integrated Project Management	<ul style="list-style-type: none">•Use organizational assets to establish project's process•Manage the project using integrated plans•Coordinate and collaborate with relevant stakeholders

Lessons Learned When Implementing CMM® and CMMI®

- Establish infrastructure early
- Manage process improvement like a project
- Include project personnel
- Pilot on select projects prior to deployment
- Process training essential to success
- Consider an integrated program plan across all disciplines

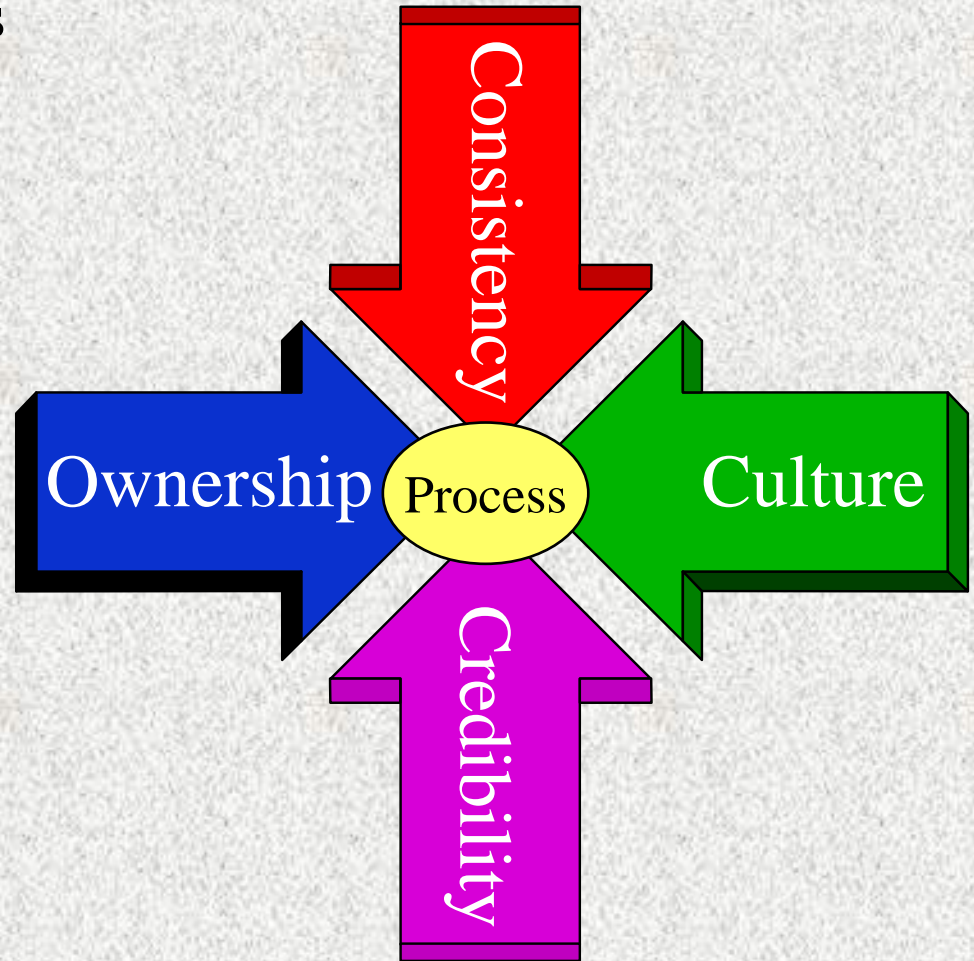


Infrastructure Creates Efficiency and Improvement



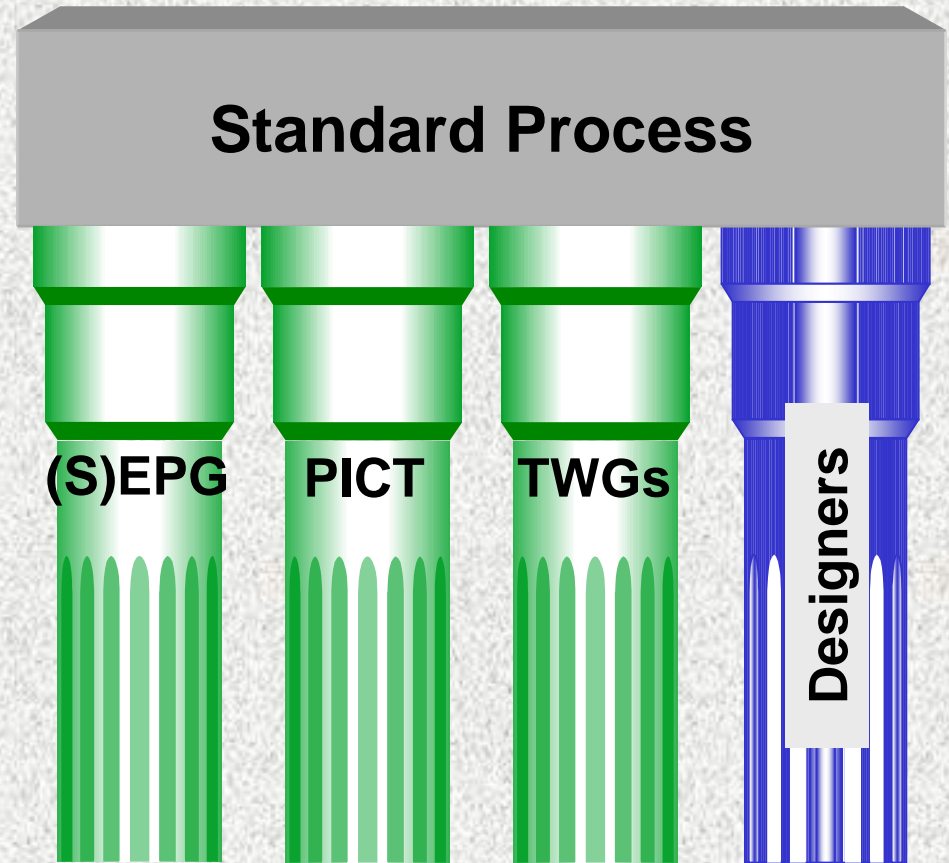
Basics of Getting Started

- Select the appropriate process group staff to achieve goals
 - Project experience
 - QA & CM reps
 - Core group full time
 - Working groups channel part-time resources
 - Outside resources
- Establish the (S)EPG, PAL, Training DB & Measurement System as soon as possible – Level 2 as foundation for higher levels



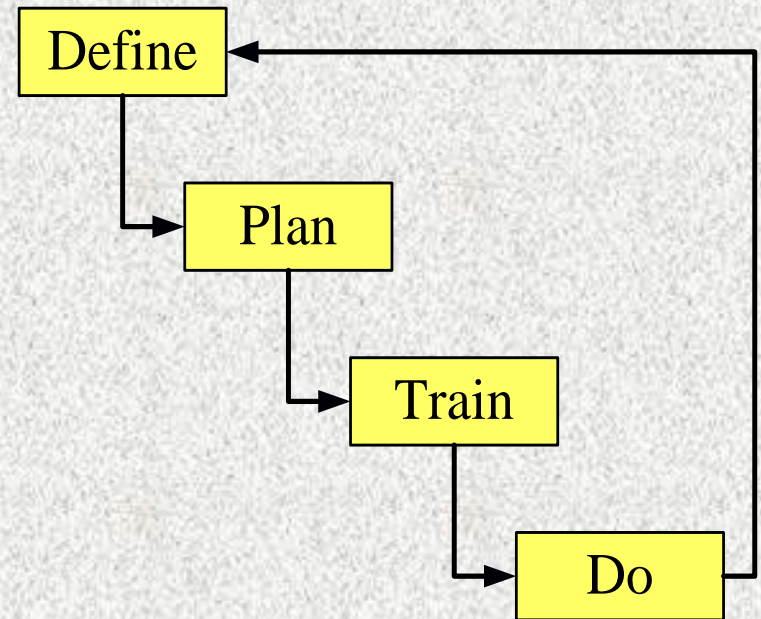
Successful Planning *Includes* Designers

- (S)EPG/PCCB: Process Group
- PICT: Process Improvement Core Team (Users' Group)
- TWG: Technology Working Groups
- *Systems, Hardware and Software Engineers*



Process Improvement is a “Project” of Itself – Not an Organizational Task

- Requirements must be well defined
- Build a little; test a little for proof of concept & methods
- Use experts to kick start the process
- Long Range Strategic Plan - vision
- Monthly Senior Mgmt reviews
- “Peer Reviews” for “buy-in”
- Staffing Needs and Capabilities Evolve over Time

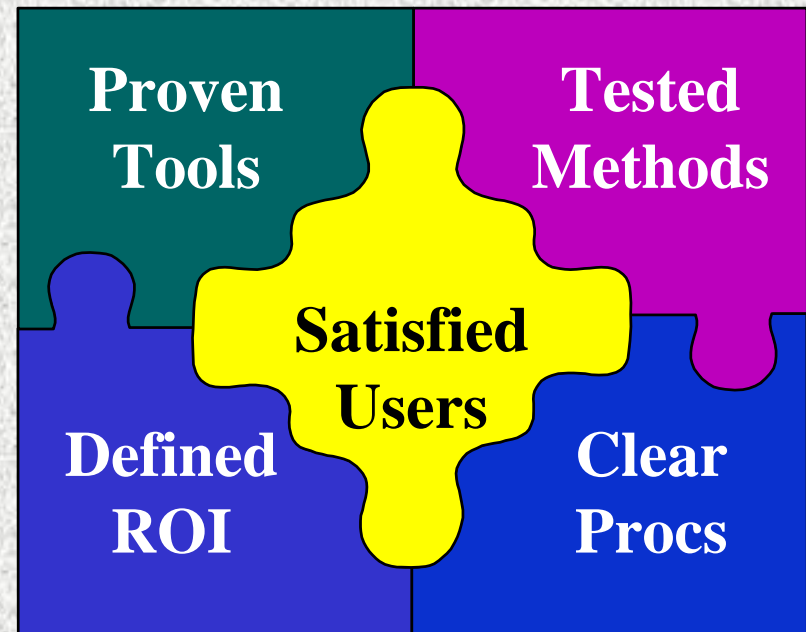


Piloting Gets The Kinks Out Early

Reducing User Dissatisfaction

- Small set of 1 to 3 projects
 - Mature
 - Open minded
- Midcourse Corrections
- Effective (S)EPG Support
- Formal Reviews
- Alternate Funding Sources
- Advantages
 - Verify process & data
 - Obtain buy-in of projects

Before rolling out process to the total organization ...



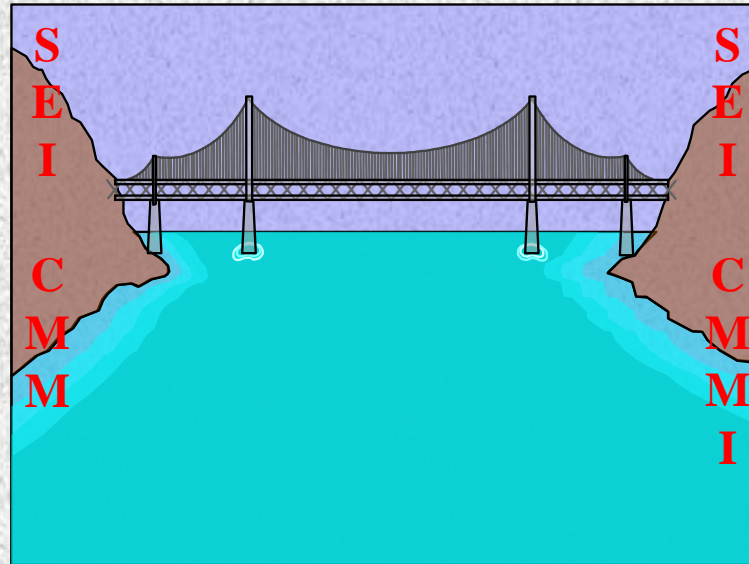
... mature the process and tools to neutralize the “nay-sayers”

Educating the Work Force

- Use classroom, mentoring and just-in-time training
- Advantages of just-in-time training
 - Mentor/trainer assigned to projects
 - Real project artifacts as homework problems
 - Mentor/trainer helps project tailor process
 - More time efficient for project leaders
- Select right personnel for mentors/trainers

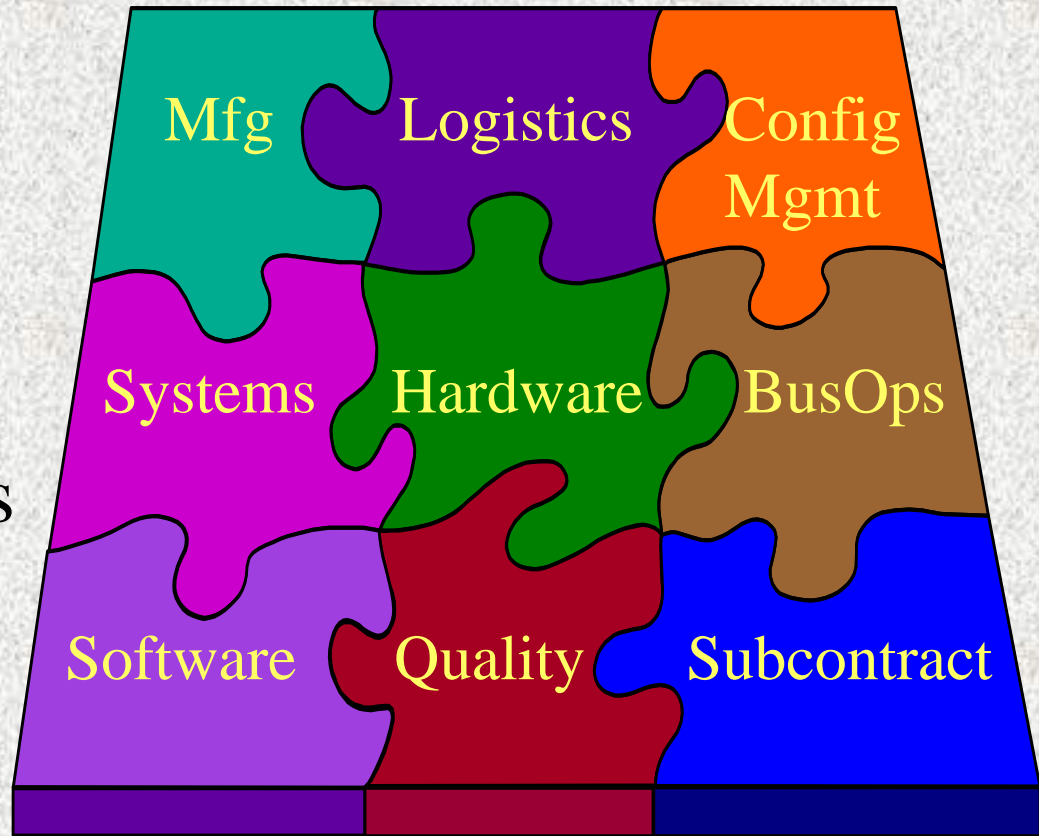


Transition to CMMI Introduced Process Integration Requirements as well as Unique Cultural Issues with Systems and Hardware Engineering



Integrated Program Plan Is Key Element

- Total Program Plan
 - Program Overview
 - Program Organization
 - Integrated Schedules
 - Integrated Metrics
- Comprehensive Plans
 - Processes
 - Work Products
 - Key Milestones
 - Acceptance Criteria
 - Responsibility



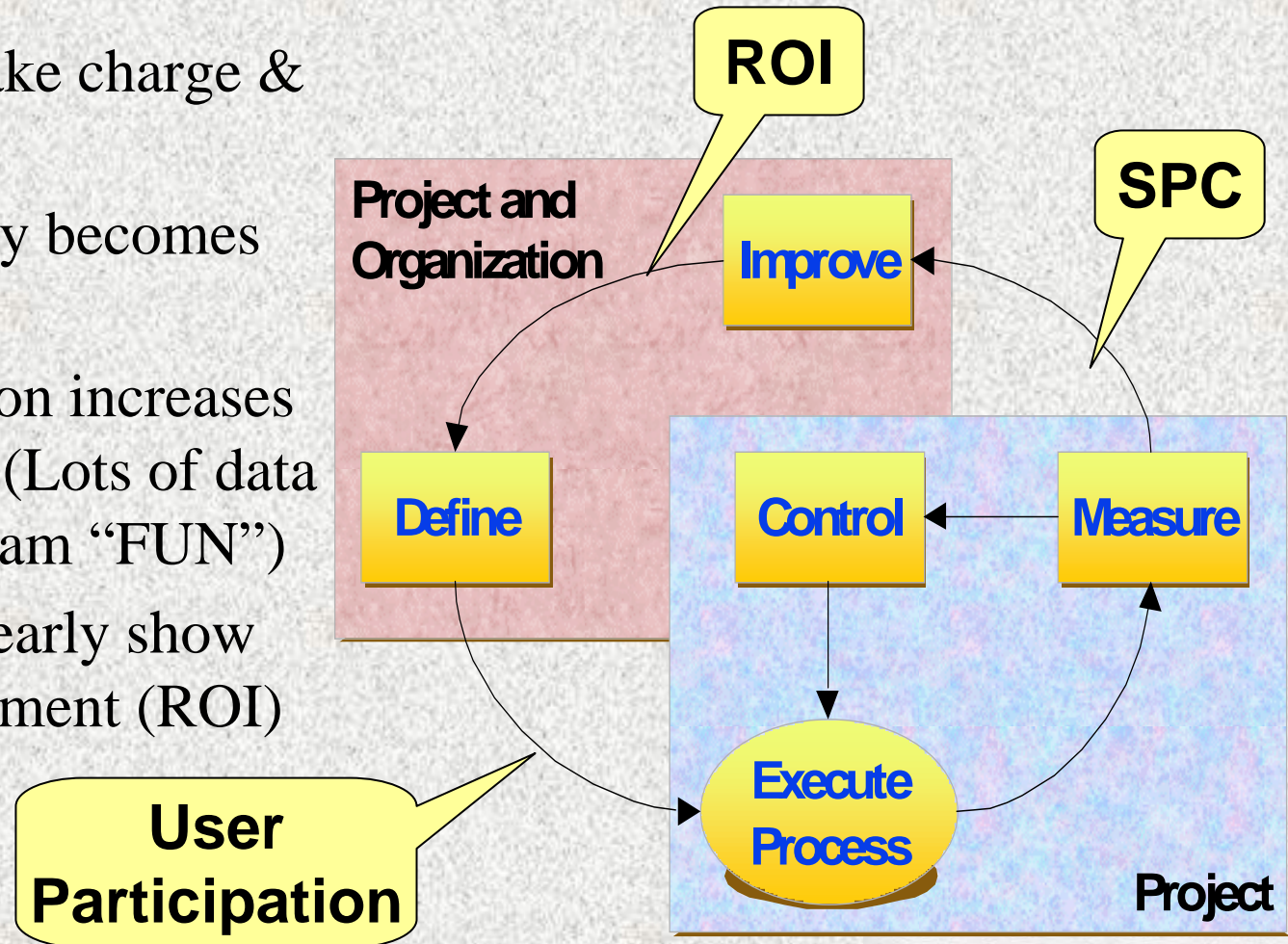
Cooperative Effort Yields Success

- Evaluate and adopt software processes that demonstrate value added, such as peer reviews
- Expand software quality role to include “total” process evaluations to program plans
- Eliminate “stovepipe” plans (unless contractual)
- Select program managers & pilots with innovative nature



Higher Levels Focus on Optimizing ROI

- Projects must take charge & drive process
- Data consistency becomes critical
- User participation increases at higher levels (Lots of data - engineer's dream "FUN")
- Results must clearly show return on investment (ROI)



Keys to Success – CMM or CMMI

- Get support of *senior management*
- Install *strong managers* in pilot programs
- Include *process lead* in project's budget
- Provide *mentors* to programs
- Start small - select a few key *pilot projects*
- Maintain involvement of designers as *team members*
- Provide an easy to use *system interface*
- Use *statistics* to provide feedback and improve products

Acknowledgements

- **® CMM, CMMI and Capability Maturity Model are registered in the U.S. Patent and Trademark Office by Carnegie Mellon University**
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Q&A



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